ANNEXURE - A

DAV PUBLIC SCHOOLS, ODISHA								
Half Yearly Examination, SUBJECT: Physics, CLASS : XI								
BLUE PRINT OF QUESTION PAPER								
S. N.	Chapters/Units	Marks Allotted	MCQ & AR (1 mark)	SA-I (2 Marks)	SA-II (3 Marks)	LS (5 Marks)	CB (4 Marks)	TOTAL
1	Ch. 2: units and measurement	46	1	1	-	-	-	03
2	Ch. 3: motion in a straight line		2+1	2	1	-	-	10
3	Ch. 4: motion in a plane		3+1	2	2	1	-	19
4	Ch. 5: laws of motion		1+1	-	1	1	1	14
5	Ch. 6: work, energy & power	24	3+1	-	2	1	-	15
6	Ch. 7: motion of system of particles & rigid body motion		2	-	1	-	1	09
TOTAL			16 X 1 = 16 Marks	5 X 2 = 10 Marks	7 X 3 = 21 Marks	3 X 5 = 15 Marks	2 X 4 = 8 Marks	70 Marks

TYPOLOGY OF QUESTION PAPER:

TYPOLOGY	WEIGHTAGE IN %	TOTAL MARKS
Remembering And Understanding	38	27
Applying	32	22
Analyzing, Evaluating and Creating	30	21

ANNEXURE - B

DAV PUBLIC SCHOOLS, ODISHA

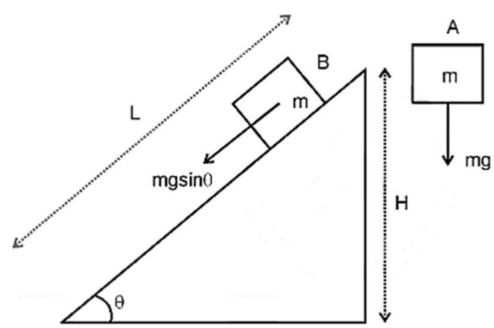
Half Yearly Exam., SUBJECT: Physics, CLASS : XI

QUESTION WISE ANALYSIS

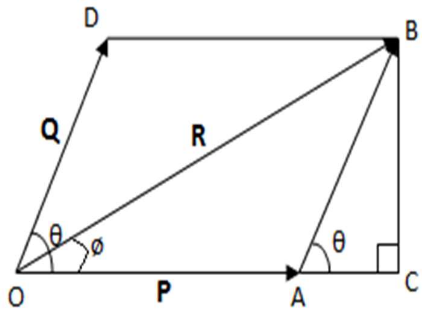
Q.N.	Chapters / Units	Forms of Question	Marks Allotted	(R), (U), (AP), (AN), (E), (C)
1	Chapter-2	MCQ	1	AP
2	Chapter-3	MCQ	1	AP
3	Chapter-3	MCQ	1	AN
4	Chapter-4	MCQ	1	AP
5	Chapter-4	MCQ	1	AP
6	Chapter-4	MCQ	1	AP
7	Chapter-5	MCQ	1	AP
8	Chapter-6	MCQ	1	R
9	Chapter-6	MCQ	1	AP
10	Chapter-6	MCQ	1	U
11	Chapter-7	MCQ	1	R
12	Chapter-7	MCQ	1	AP
13	Chapter-3	MCQ (AR)	1	U
14	Chapter-4	MCQ (AR)	1	U
15	Chapter-5	MCQ (AR)	1	U
16	Chapter-6	MCQ (AR)	1	U
17	Chapter-2	SA-I	2	U
18	Chapter-3	SA-I	2	U
19	Chapter-3	SA-I	2	U
20	Chapter-4	SA-I	2	U
21	Chapter-4	SA-I	2	AP
22	Chapter-3	SA-II	3	AN
23	Chapter-4	SA-II	3	AP
24	Chapter-4	SA-II	3	R
25	Chapter-5	SA-II	3	AN
26	Chapter-6	SA-II	3	R
27	Chapter-6	SA-II	3	U
28	Chapter-7	SA-II	3	U
29	Chapter-5	CB	4	AP
30	Chapter-7	CB	4	C
31	Chapter-4	LA	5	E
32	Chapter-5	LA	5	E
33	Chapter-6	LA	5	AP

ANNEXURE - C

DAV PUBLIC SCHOOLS, ODISHA			
Half Yearly Exam., SUBJECT: Physics, CLASS : XI			
QUESTION WISE ANALYSIS			
Q.N.	**Value Points**	**Marks Allotted**	**Page No.of NCERT**
1	(b) 5, 1, 2	1	29
2	(a) 4s	1	48
3	(c) $\sqrt{t_1 t_2}$	1	48
4	(a) 60^0	1	78
5	(b) magnitude	1	69
6	(c) $7\sqrt{2}$ m/sec	1	76
7	(c) 3.6 N s	1	94
8	(a) less than sliding friction	1	103
9	(b) 100N/m	1	123
10	(b) The stone flies off tangentially from the instant the string breaks.	1	104
11	(c) A hollow sphere about any of its diameter.	1	165
12	(c) $(-18\,\hat{\imath} - 13\hat{\jmath} + 2\hat{k})$ m/sec	1	153
13	(a) Both A & R are true and R is the correct explanation of A.	1	47
14	(a) Both A & R are true and R is the correct explanation of A.	1	78
15	(b) Both A & R are true but R is NOT the correct explanation of A.	1	99
16	(c) A is true but R is false.	1	104
17	$[a] = [T^2]$ $[b] = [M^{-1}L^{-3}T^4]$ $[a \times b] = [M^{-1}L^{-3}T^6]$	0.5 1 0.5	32
18	$avg\ speed = \frac{total\ distance\ travelled}{total\ time\ taken} =$ $\frac{25+25+25}{\frac{25}{15}+\frac{25}{15}+\frac{25}{15}} = 15m/s$ $avg\ velocity = \frac{total\ displacement}{total\ time\ taken} =$ $\frac{25}{\frac{25}{15}+\frac{25}{15}+\frac{25}{15}} = 5m/s$	1 1	45
19	$a_A : a_B$ = tan 30^0 : tan 45^0 = $\frac{1}{\sqrt{3}}$: 1	2	46

OR	Area under the curve, $(10 \times 5) + \frac{1}{2}(5+10) \times 2 = 65m$	2	46
20	$x = u.cos\theta.t, \Rightarrow t = \frac{x}{u.cos\theta}$ $y = u.sin\theta.t - \frac{1}{2}gt^2 = u.sin\theta.\left(\frac{x}{u.cos\theta}\right) - \frac{1}{2}g\left(\frac{x}{u.cos\theta}\right)^2$ $\Rightarrow y = tan\theta.x - \frac{g}{2u^2.cos^2\theta}x^2$ It represents the equation of a parabola, hence the path followed by a projectile is a parabola.	0.5 0.5 0.5 0.5	78
21	Magnitude of Resultant: $R = \sqrt{F_1^2 + F_2^2} = \sqrt{8^2 + 6^2} = 10N$ Direction of Resultant: $\theta = \tan^{-1}\frac{F_2}{F_1} = \tan^{-1}\frac{6}{8}$ Applying Newton's second Law, $F_{net} = ma$ $\Rightarrow 10 = 5a, \Rightarrow a = 2\ m/sec^2$ **NOTE:** Accept the answer, if the direction of the resultant is derived using the angle with F_2, i.e. $\theta = \tan^{-1}\frac{F_1}{F_2} = \tan^{-1}\frac{8}{6}$	0.5 0.5 1	72 & 95
22	For the object A, $H = \frac{1}{2}g(t_1)^2$ $\Rightarrow t_1 = \sqrt{\frac{2H}{g}}$ For the object B, $L = \frac{1}{2}(gsin\theta)(t_2)^2$ $\Rightarrow t_2 = \sqrt{\frac{2L}{gsin\theta}}$ $So, \frac{t_2}{t_1} = \frac{\sqrt{\frac{2L}{gsin\theta}}}{\sqrt{\frac{2H}{g}}} = \frac{\sqrt{\frac{2L}{gsin\theta}}}{\sqrt{\frac{2Lsin\theta}{g}}} = \frac{1}{sin\theta} = cosec\theta$ 	1 1 1	48 & 69
23	The two bodies will collide at the highest point if both cover the same vertical height in the same time. $\frac{v_1^2.sin^2 45}{2g} = \frac{v_2^2}{2g}$ $\frac{v_1^2}{v_2^2} = sin^2 45°$ $\frac{v_1}{v_2} = \sin 45° = \frac{1}{\sqrt{2}}$	1.5 1.5	78
24	Statement	1	72

<table>
<tr>
<td></td>
<td>Let P and Q be two vectors acting simultaneously at a point and represented both in magnitude and direction by two adjacent sides OA and OD of a parallelogram OABD as shown in figure. Let θ be the angle between P and Q and R be the resultant vector. Then, according to parallelogram law of vector addition, diagonal OB represents the resultant of P and Q.



From triangle OCB,
$OB^2 = OC^2 + BC^2$
$or, OB^2 = (OA + AC)^2 + BC^2 \;......(i)$
In triangle ABC,
$\cos\theta = \frac{AC}{AB}$
$or, AC = AB\cos\theta$
$or, AC = OD\cos\theta = Q\cos\theta \quad [\because AB = OD = Q]$
Also,
$\cos\theta = \frac{BC}{AB}$
$or, BC = AB\sin\theta$
$or, BC = OD\sin\theta = Q\sin\theta \quad [\because AB = OD = Q]$

Substituting value of AC and BC in (i), we get
$R^2 = (P + Q\cos\theta)^2 + (Q\sin\theta)^2$
$or, R^2 = P^2 + 2PQ\cos\theta + Q^2\cos^2\theta + Q^2\sin^2\theta$
$or, R^2 = P^2 + 2PQ\cos\theta + Q^2$
$\therefore R = \sqrt{P^2 + 2PQ\cos\theta + Q^2}$</td>
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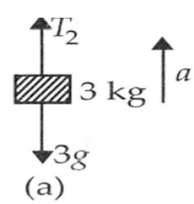
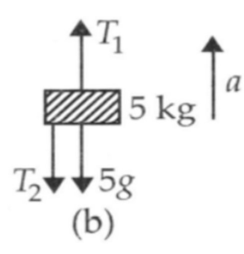
<td>25</td>
<td>The free body diagram of 3 kg block is as shown in the fig. (a).
The equation of motion of 3 kg block is $T_2 - 3g = 3a$
$T_2 = 3(a + g) = 3(2 + 10) = 36N$ ....(i)



The free body diagram of 5 kg is as shown in the Fig.(b).
The equation of motion of 5kg block is
$T_1 - T_2 - 5g = 5a$
$T_1 = 5(a + g) + T_2$
$= 5(2 + 10) + 36 = 96N$ (Using (i))


</td>
<td>1.5

1.5</td>
<td>102</td>
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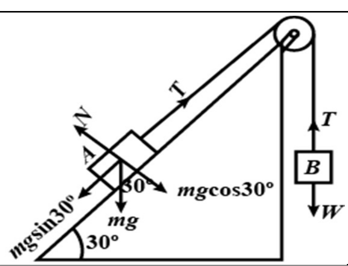
<td>OR</td>
<td>

$W = mg\ sin\theta = mg\ sin30^0 = 50N$</td>
<td>1.5+1.5</td>
<td>102</td>
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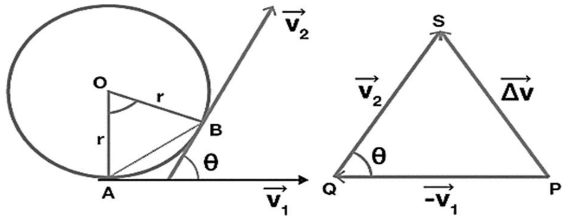
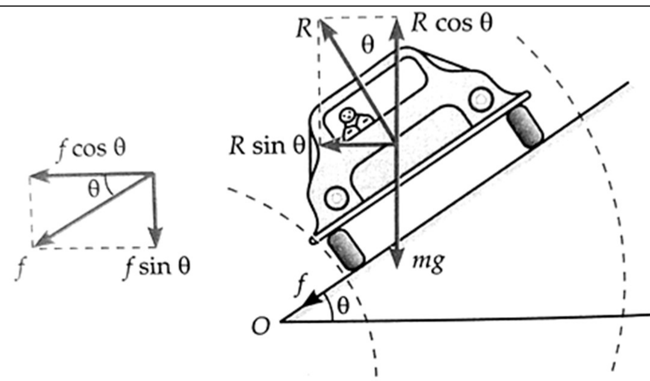
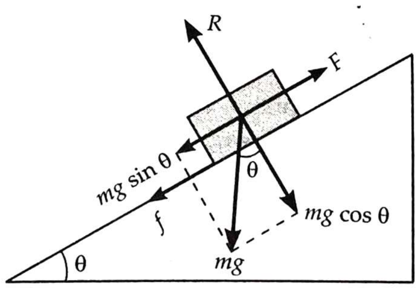
26	Statement: The work done by an object when force acts on it is equal to the change in kinetic energy. Proof :the time rate of kinetic energy is $\frac{dK}{dt} = \frac{d}{dt}\left(\frac{1}{2}mv^2\right)$ $= m\frac{dv}{dt}v$ $= Fv$ (from Newton's Second Law) $= F\frac{dx}{dt}$ Thus $dK = Fdx$ Integrating from the initial position (x_i) to final position (x_f), we have $\int_{K_i}^{K_f} dK = \int_{x_i}^{x_f} Fdx$ where, K_i and K_f are the initial and final kinetic energies corresponding to x_i and x_f. or $K_f - K_i = \int_{x_i}^{x_f} Fdx$ $K_f - K_i = W$ Thus, the WE theorem is proved for a variable force.	1 1 1	119
27	(i) The force under the action of which work done is independent of the path followed is known as Conservative Force. (ii) $\frac{1}{2} mv^2 = \frac{1}{2} kx_m^2$ $x_m = \sqrt{\frac{mv^2}{k}} = \sqrt{\frac{1000 \times \left(18 \times \frac{5}{18}\right)^2}{6.25 \times 10^3}} = 2\, m$	1 1 1	121
28	Initial speed of fly wheel $= \omega_i = (60x2\pi)/60 = 2\pi$ $final\ angular\ velocity\ of\ fly\ wheel = \omega_f = (360x2\pi)/60 = 12\pi$ $Rotational\ energy\ of\ fly\ wheel,$ $K.E. = \frac{1}{2}I(\omega_f{}^2 - \omega_i{}^2) = 484\, J$ $\Rightarrow I = 0.7\, kg.m^2$	0.5 0.5 1 1	170
29	(i) (c) 1.5kg (ii) (d) 2v (iii) (d) nmv **OR** (c) $\frac{Mv}{M-m}$ (iv) (b) 200N	1 1 1 1	99
30	(i) (a) (1, 10/3) (ii) (a) l /2 (iii) (c) in inverse ratio of masses of particles (iv) (a) zero **OR** (b) ≤ R	1 1 1 1	148
31	(i) $(\vec{A} + \vec{B}).\vec{C} = 0, \Rightarrow (3\hat{\imath} - 2\hat{\jmath}).(\hat{\imath} - x\hat{\jmath}) = 0, \Rightarrow x = -\frac{3}{2}$ (ii) L.H.S.: $\vec{A}.(\vec{B} + \vec{C}) = (\hat{\imath} - 2\hat{\jmath} + \hat{k}).\left\{(2\hat{\imath} - \hat{k}) + \left(\hat{\imath} + \frac{3}{2}\hat{\jmath}\right)\right\} = -1$ R.H.S.: $(\vec{A}.\vec{B}) + (\vec{A}.\vec{C}) = \{(\hat{\imath} - 2\hat{\jmath} + \hat{k}).(2\hat{\imath} - \hat{k})\} + \left\{(\hat{\imath} - 2\hat{\jmath} + \hat{k}).\left(\hat{\imath} + \frac{3}{2}\hat{\jmath}\right)\right\} = -1$ (iii) $\vec{X} = \|\vec{X}\|\hat{X} = \|\vec{A}\|\hat{B} = \|\vec{A}\|\frac{\vec{B}}{\|\vec{B}\|} = \sqrt{6}\frac{2\hat{\imath} - \hat{k}}{\sqrt{5}} = \sqrt{\frac{6}{5}}(2\hat{\imath} - \hat{k})$	1 0.5 1 1.5	73

	(iv) $\vec{X} = \vec{A} \times \vec{B} = \begin{vmatrix} \hat{\imath} & -\hat{\jmath} & \hat{k} \\ 1 & -2 & 1 \\ 2 & 0 & -1 \end{vmatrix} = 2\hat{\imath} + 3\hat{\jmath} + 4\hat{k}$	1	
OR	 From the diagram given above, we can say that, $\overrightarrow{PQ} + \overrightarrow{QS} = \overrightarrow{PS}$ $-v_1 + v_2 = \Delta v$ $\Delta v = v_2 - v_1$ The triangle PQS and AOB are similar. Therefore, $\frac{\Delta v}{AB} = \frac{v}{r}$ $AB = arc\ AB = v\Delta t$ $\frac{\Delta v}{v\Delta t} = \frac{v}{r}$ $\frac{\Delta v}{\Delta t} = \frac{v^2}{r}$ $a = \frac{v^2}{r}$ (ii) $\omega = \frac{2\pi}{T} = \frac{2\pi}{\left(\frac{100}{7}\right)} = \frac{14\pi}{100} = 0.44\ rad/sec$ $v = r\omega = 12 \times 0.44 = 5.28\ cm/sec$	1 1 1 1 1	80
32		1	
	Equating the forces along horizontal and vertical directions respectively, we get $R\sin\theta + f\cos\theta = \frac{mv^2}{r}$ ...(1) $mg + f\sin\theta = R\cos\theta$, where $f = \mu R$ or $R\cos\theta - f\sin\theta = mg$ ...(2) Dividing equation (1) by equation (2), we get $\frac{R\sin\theta + f\cos\theta}{R\cos\theta - f\sin\theta} = \frac{v^2}{rg}$	0.5 0.5 0.5	104

	Dividing numerator and denominator of L.H.S. by $R\cos\theta$, we get $$\frac{\tan\theta + \frac{f}{R}}{1 - \frac{f}{R}\tan\theta} = \frac{v^2}{rg}$$ or $$\frac{\tan\theta + \mu}{1 - \mu\tan\theta} = \frac{v^2}{rg} \quad \left[\because \mu = \frac{f}{R}\right]$$ or $v^2 = rg\left[\frac{\mu + \tan\theta}{1 - \mu\tan\theta}\right]$ or $v = \sqrt{rg \cdot \frac{\mu + \tan\theta}{1 - \mu\tan\theta}}$ (ii) Since the road is level & we are on a motor bike, the following steps can be adopted to increase the maximum safe velocity (a) move to the outer edge of the road so that radius (r) can be increased (b) bend towards the centre of the curved road which will increase the value of $tan\theta$ (c) check whether the treads of the tyres are in good condition so that the of μ can be increased	0.5 0.5 0.5 x 3	
OR	(i) (a) Independent of area of contact. (b) Increases proportionately with increase in normal reaction $(f_l = \mu_l N)$ (ii) Diagram showing all type of force acting on it.  Since the acceleration a is along F, we have $F_{net} = ma = F - f - mgsin\theta$ ....(1) Again, $f = \mu R = \mu.mgcos\theta$ Putting this in equation (1), $F_{net} = ma = F - \mu.mgcos\theta - mgsin\theta$ $\Rightarrow a = \frac{F - \mu.mgcos\theta - mgsin\theta}{m}$	1 1 1 1 1	102
33	(i) Tension in the string at any height h is given by, $T = \frac{m}{r}(u^2 + gr - 3gh)$ $\Rightarrow 0 = \frac{m}{r}(u^2 + gr - 3gh_1)$ $\Rightarrow h_1 = \frac{u^2 + gr}{3g}$ (ii) Velocity of the body at any height h is given by, $v = \sqrt{u^2 - 2gh}$ $\Rightarrow 0 = \sqrt{u^2 - 2gh_2}$ $\Rightarrow h_2 = \frac{u^2}{2g}$ (iii)If $h_1 > h_2$, i.e., the body will achieve a point where its velocity becomes zero before the tension in the string is zero. Hence the body will go for an oscillation.	1 1 1 1 1	122
OR	(i)		129

	$m_1u_1 + m_2u_2 = (m_1 + m_2)v$ $\Rightarrow \text{v} = \frac{m_1u_1 + m_2u_2}{m_1 + m_2}$ … … … … … … … (1) $\Delta K.E. = K.E._f - K.E._i$ $= \left(\frac{1}{2}m_1{u_1}^2 + \frac{1}{2}m_2{u_2}^2\right) - \frac{1}{2}(m_1 + m_2)v^2$ $= \left(\frac{1}{2}m_1{u_1}^2 + \frac{1}{2}m_2{u_2}^2\right) - \frac{1}{2}(m_1 + m_2)\left(\frac{m_1u_1 + m_2u_2}{m_1 + m_2}\right)^2$ $= \left(\frac{1}{2}m_1{u_1}^2 + \frac{1}{2}m_2{u_2}^2\right) - \frac{1(m_1u_1 + m_2u_2)^2}{2 \quad m_1 + m_2}$ $= \frac{1}{2}\left[(m_1{u_1}^2 + m_2{u_2}^2) - \frac{(m_1u_1 + m_2u_2)^2}{m_1 + m_2}\right]$ $= \frac{1}{2}\left[\frac{[{m_1}^2{u_1}^2 + m_1m_2{u_1}^2 + {m_2}^2{u_2}^2 + m_1m_2{u_2}^2 - {m_1}^2{u_1}^2 - {m_2}^2{u_2}^2 - 2m_1m_2u_1u_2]}{m_1 + m_2}\right]$ $= \frac{1}{2}\left[\frac{[m_1m_2{u_1}^2 + m_1m_2{u_2}^2 - 2m_1m_2u_1u_2]}{m_1 + m_2}\right]$ $= \frac{m_1m_2(u_1 - u_2)^2}{2(m_1 + m_2)}$ (ii) When the ball strikes the ground, $mgh = \frac{1}{2}mv^2$ $\Rightarrow \text{v} = \sqrt{2gh}$ … … … … (1) When the ball rebounds, $mg\frac{h}{4} = \frac{1}{2}mv'^2$ $\Rightarrow \text{v}' = \sqrt{\frac{gh}{2}}$ … … … … (2) Hence coefficient of restitution is, $e = \frac{\sqrt{\frac{gh}{2}}}{\sqrt{2gh}} = \frac{1}{2}$	0.5 2.5 0.5 0.5 1	